REMARKS

Claims 12-21 are all the claims pending in the application.

Claims 12-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Uemura (US 6,331,450 B1) in view of Chen et al (US 6,642,549 B2; "Chen").

Applicants traverse, and respectfully request the Examiner to reconsider in view of the following remarks and the Declaration evidence submitted herewith.

Independent claim 12 recites a gallium nitride-based compound semiconductor light-emitting device comprising a transparent positive electrode having a contact metal layer in contact with a p-type semiconductor layer, a current diffusing layer on the contact metal layer, the current diffusing layer having an electrical conductivity larger than that of the contact metal layer, and a bonding pad layer on the current diffusing layer, wherein the thickness of the contact metal layer is from 0.1 to 7.5 nm.

On page 2 of the Office Action, the Examiner asserted that "Uemura discloses a gallium nitride-based compound (Fig. 1, col. 4, lines 40-41) semiconductor light-emitting device (Fig. 1, col. 4, lines 40-41), comprising a transparent positive electrode 113..." It is Applicants' understanding that the Examiner intended to refer to numeral 120 (not 113) of Uemura as a transparent positive electrode. See Col. 5, lines 1-15 of Uemura. Clarification is requested.

Applicants respectfully disagree with the Examiner's reading and understanding of Uemura.

Uemura, either alone or in view of Chen, does not disclose a gallium nitride-based compound semiconductor light-emitting device comprising a transparent positive electrode, including a contact metal layer having a thickness of from 0.1 to 7.5 nm, as required by independent claim 12 of the present application.

In particular, as shown in Fig. 1 of Uemura, the light from emission layer 104 is reflected on the interface of first metal layer 111 and p-layer 106, and therefore, the electrode 120 of Uemura is not a transparent electrode and therefore does not meet the present claims.

The present invention is directed to a gallium nitride-based compound semiconductor light-emitting device comprising a transparent positive electrode, which transmits light from an emission layer. Therefore, the electrode 120 of Uemura and the instantly claimed transparent positive electrode are entirely different from each other with respect to their functionalities.

In this connection, Applicants provide herewith an executed Declaration by Mr. Watanabe, one of the inventors of the present application, showing that the claimed contact metal layer having the thickness in a range of 0.1 to 7.5 nm has the desired transparency, and that the relatively thick (about 300 nm) first metal layer of Uemura does not.

The instant specification discloses at page 6, third paragraph, that if the thickness of the contact metal layer is less than 0.1 nm, a stabilized thin film can hardly be obtained, whereas if it exceeds 7.5 nm, the transparency decreases.

Furthermore, the Examiner acknowledged that Uemura does not disclose the claimed thickness of the contact metal layer of from 0.1 to 7.5 nm. However, the Examiner contended that Uemura discloses a contact metal layer thickness of 0.3 μm (col. 5, lines 10-13). The Examiner took the position that it would have been obvious to use any suitable thickness for the device.

Applicants disagree.

As demonstrated in Declaration by Mr. Watanabe, contrary to the Examiner's assertion, there is no apparent reason to reduce the thickness of the contact metal layer <u>by forty fold</u> (to an upper limit of 7.5 nm) so as to obtain a *transparent* contact metal layer having a property

opposite that of the *opaque* contact metal layer of Uemura. Indeed, reducing the thickness of the contact metal layer of Uemura as suggested by the Examiner would render the device of Uemura unsatisfactory for its intended purpose.

The contact metal layer 111 of Uemura reflects light from emission layer 104, and thus serves as a reflective layer. If the contact metal layer 111 of Uemura had a thickness of 7.5 nm or less, as is the case with the present invention, the light from emission layer 104 would transmit through contact metal layer 111 and then reflect on current diffusion layer 112. Since current diffusion layer 112 comprises gold (Au), it reflects yellow and red light and absorbs blue and green light. Referring to the description of gold in Wikipedia (a copy of which is attached), if gold is so thin as to be translucent, the transmitted light appears greenish blue, because gold strongly reflects yellow and red lights (see the underlined part in the attached printout of the corresponding web site). In other words, gold transmits blue and green light when it is thin enough; however, it absorbs such blue and green light when its thickness is as thick as 1.2 μm. Accordingly, if the contact metal layer 111 in the device of Uemura had a thickness of 7.5 nm or less, blue light emitted from emission layer 104 could not be drawn outside the device. Consequently, the device could not operate as a light emitting device.

Therefore, it is would be impossible to adapt a contact metal layer having the claimed thickness of the present invention, to a light-emitting device of Uemura.

In view of the above, the present invention is patentable over the cited references and Applicants respectfully request reconsideration and withdrawal of the present §103 rejection of claims 12-20.

Reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be

best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: December 22, 2009

Gold

From Wikipedia, the free encyclopedia

Gold (pronounced /ˈgoʊld/) is a chemical element with the symbol **Au** (Latin: *aurum*) and an atomic number of 79. It has been a highly sought-after precious metal for coinage, jewelry, and other arts since the beginning of recorded history. The metal occurs as nuggets or grains in rocks, in veins and in alluvial deposits. Gold is dense, soft, shiny and the most malleable and ductile pure metal known. Pure gold has a bright yellow color and luster traditionally considered attractive, which it maintains without oxidizing in air or water. Gold is one of the coinage metals and has served as a symbol of wealth and a store of value throughout history. Gold standards have provided a basis for monetary policies. It also has been linked to a variety of symbolisms and ideologies.

A total of 161,000 tonnes of gold have been mined in human history, as of 2009.[1] Modern industrial uses include dentistry and electronics, where gold has traditionally found use because of its good resistance to oxidative corrosion and excellent quality as a conductor of electricity.

Chemically, gold is a transition metal and can form trivalent and univalent cations in solutions. Compared with other metals, pure gold is more chemically unreactive, but it is attacked by aqua regia (a mixture of acids), forming chloroauric acid, and by alkaline solutions of cyanide but not by single acids such as hydrochloric, nitric or sulfuric acids. Gold dissolves in mercury, forming amalgam alloys, but does not react with it. Gold is insoluble in nitric acid, which dissolves silver and base metals. This property is exploited in the gold refining technique known as "inquartation and parting". Nitric acid has long been used to confirm the presence of gold in items, and this is the origin of the colloquial term "acid test", referring to a *gold standard* test for genuine value.

platinum ← **gold** → mercury

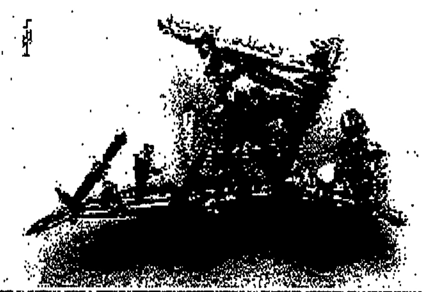
Ag ↑ **Au** ↓ Rg

79Au

Periodic table

Appearance

metallic yellow



General properties	
Name, symbol, number	gold, Au, 79
Element category	transition metal
Group, period, block	11, 6, d
Standard atomic weight	196.966569(4) $g \cdot mol^{-1}$
Electron configuration	[Xe] $4f^{14}\,5d^{10}\,6s^{1}$
Electrons per shell	2, 8, 18, 32, 18, 1 (Image)
Physical properties	
Phase	solid
Density (near r.t.)	19.30 $g \cdot cm^{-3}$
Liquid density at m.p.	17.31 $g \cdot cm^{-3}$
Melting point	1337.33 K, 1064.18 °C, 1947.52 °F
Boiling point	3129 K, 2856 °C, 5173 °F
Heat of fusion	12.55 $kJ \cdot mol^{-1}$
Heat of vaporization	324 $kJ \cdot mol^{-1}$
Specific heat capacity	(25 °C) 25.418 $J \cdot mol^{-1} \cdot K^{-1}$

Vapor pressure

P/Pa	1	10	100	1 k	10 k	100 k
at *T*/K	1646	1814	2021	2281	2620	3078

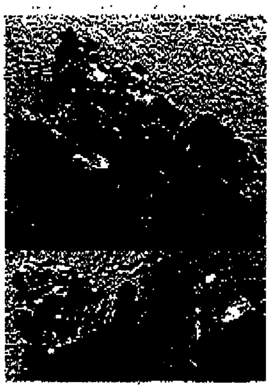
Atomic properties	
Oxidation states	-1, 1, 2, **3**, 4, 5 (amphoteric oxide)
Electronegativity	2.54 (Pauling scale)
Ionization energies	1st: 890.1 $kJ \cdot mol^{-1}$

Contents

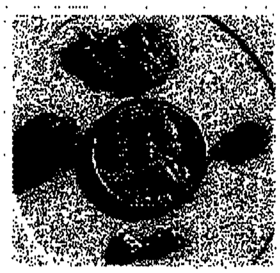
	2nd: 1980 kJ·mol^{-1}
Atomic radius	144 pm
Covalent radius	136±6 pm
Van der Waals radius	166 pm
Miscellanea	
Crystal structure	Lattice face centered cubic
Magnetic ordering	diamagnetic
Electrical resistivity	(20 °C) 22.14 nΩ·m
Thermal conductivity	(300 K) 318 W·m^{-1}·K^{-1}
Thermal expansion	(25 °C) 14.2 µm·m^{-1}·K^{-1}
Speed of sound (thin rod)	(r.t.) 2030 m·s^{-1}
Tensile strength	120 MPa
Shear modulus	27 GPa
Bulk modulus	180 GPa
Poisson ratio	0.44
Mohs hardness	2.5
Vickers hardness	216 MPa
Brinell hardness	? 2450 MPa
CAS registry number	7440-57-5
Most stable isotopes	
Main article: Isotopes of gold	

iso	NA	half-life	DM	DE (MeV)	DP
^{195}Au	syn	186.10 d	ε	0.227	^{195}Pt
^{196}Au	syn	6.183 d	ε	1.506	^{196}Pt
			β^-	0.686	^{196}Hg
^{197}Au	100%	^{197}Au is stable with 118 neutrons			
^{198}Au	syn	2.69517 d	β^-	1.372	^{198}Hg
^{199}Au	syn	3.169 d	β^-	0.453	^{199}Hg

Characteristics



Native gold nuggets



Gold nuggets found in Arizona

Gold is the most malleable and ductile of all metals; a single gram can be beaten into a sheet of 1 square meter, or an ounce into 300 square feet. Gold leaf can be beaten thin enough to become translucent. The transmitted light appears greenish blue, because gold strongly reflects yellow and red.[2] Such semi-transparent sheets also strongly reflect infrared light, making them useful as infrared (radiant heat) shields in visors of heat-resistant suits, and in sun-visors for spacesuits.[3]

Gold readily creates alloys with many other metals. These alloys can be produced to modify the hardness and other metallurgical properties, to control melting point or to create exotic colors (see below). Gold is a good conductor of heat and electricity and reflects infrared radiation strongly.